

CLAIMS

1. An apparatus for differentially encoding symbols, comprising:

- 5 a differential encoder operable to encode a first symbol as the difference between a first carrier state at a first symbol interval and an adjacent carrier state at a first symbol interval, and operable to encode a second symbol as the difference between said first carrier state at said first symbol interval and said first carrier state at an adjacent symbol interval, and
- 10 a modulator coupled to said differential encoder and operable to modulate said symbols onto a signal.

2. An apparatus for differentially decoding symbols, comprising:

- a demodulator, operable to receive a signal and demodulate at least two sub-
- 15 carriers therefrom. and
- a decoder coupled to said demodulator and operable to decode a first symbol as the difference between a first carrier state at a first symbol interval and an adjacent carrier state at a first symbol interval, and operable to decode a second symbol as the difference between said first carrier state at said first symbol interval and said first
- 20 carrier state at an adjacent symbol interval.

3. A transmitter for encoding symbols on a plurality of sub-carriers at a plurality of symbol intervals, comprising:

- a differential encoder operable to receive binary data and to output a digital
- 25 signal that encodes said binary data as symbols that are the difference between the states of at least a first and second adjacent sub-carriers at a symbol interval, and,

that are the difference between the states of a sub-carrier at at least a first and second adjacent symbol intervals;

a digital to analog converter coupled to receive and convert said digital signal to an analog signal, and to output said analog signal, and

5 a modulator coupled to said digital to analog converter to receive and modulate said analog signal onto a carrier signal.

4. A receiver for decoding symbols differentially encoded on a plurality of sub-carriers at a plurality of symbol intervals, comprising:

10 a demodulator having an input for receiving a plurality of sub-carriers, said demodulator operable to demodulate and output an analog signal;

an analog to digital converter coupled to receive said analog signal from said demodulator and to output a digital signal, and

15 a differential decoder coupled to receive said digital signal from said analog to digital converter, and operable to compare the state of at least a first and second adjacent sub-carrier at a symbol interval to decode at least a first symbol across frequency as the difference in said sub-carriers' states, and operable to compare the state of a sub-carrier at at least a first and second adjacent symbol intervals to decode at least a first symbol across time as the difference in said sub-carrier states, and
20 operable to output said symbols.

5. A method of differentially encoding symbols, comprising the steps of:

encoding a first symbol as the difference between a first carrier state and an adjacent carrier state at a first symbol interval, and

25 encoding a second symbol as the difference between said first carrier state at said first symbol interval and said first carrier state at an adjacent symbol interval.

6. A method of differentially decoding symbols, comprising the steps of:

decoding a first symbol as the difference between a first carrier state and an adjacent carrier state at a first symbol interval, and

5 decoding a second symbol as the difference between said first carrier state at said first symbol interval and said first carrier state at an adjacent symbol interval.

7. A method of differentially encoding packets on a plurality of sub-carriers at a plurality of symbol intervals, comprising the steps of:

10 modulating the state of at least a first and second adjacent sub-carriers at a symbol interval to encode at least a first symbol across frequency as the a difference in sub-carrier states, and

modulating the state of a sub-carrier at at least a first and second adjacent symbol intervals to encode at least a first symbol across time as the difference between adjacent symbol intervals.

15 8. A method of decoding data packets that contain data symbols differentially encoded on a plurality of sub-carriers at a plurality of symbol intervals, comprising the steps of:

20 comparing the state of at least a first and second adjacent sub-carrier at a symbol interval to decode at least a first symbol across frequency as the difference in said sub-carriers' states;

comparing the state of a sub-carrier at at least a first and second adjacent symbol intervals to decode at least a first symbol across time as the difference is said sub-carrier states.

25 9. A method of differentially encoding data packets on a plurality of sub-carriers, comprising the steps of:

in a first symbol interval, modulating the state of each sub-carrier to sequentially encode a set of symbols across frequency as the difference between adjacent sub-carrier states from a first sub-carrier state to a last sub-carrier state;

for each subsequent symbol interval in said data packet, modulating a first sub-carrier state to encode a symbol across time as the difference in sub-carrier state with respect to the last sub-carrier state in the previous symbol interval, and

for each of said subsequent symbol intervals, modulating the state of each sub-carrier to sequentially encode a set of symbols across frequency as the difference between adjacent sub-carrier states from said first sub-carrier state to a last sub-carrier state.

10. A method of decoding data packets that contain data symbols differentially encoded on a plurality of sub-carriers, comprising the steps of:

receiving the plurality of sub-carriers for the duration of a data packet;

in a first symbol interval, sequentially comparing the difference between adjacent sub-carrier states from a first sub-carrier state to a last sub-carrier state to decode a first set of symbols across frequency;

for each subsequent symbol interval in said data packet, comparing a first sub-carrier state with the last sub-carrier state in the pervious symbol interval to decode a symbol across time, and

for each of said subsequent symbol intervals, sequentially comparing the difference between adjacent sub-carrier states from said first sub-carrier state to a last sub-carrier state in the present symbol interval to decode a subsequent set of symbols across frequency.